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September 16, 2003

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APPLICATION NUMBER: *60/403,655*
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By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(b)(2).

INVENTOR(s)/APPLICANT(s)

Given Name (first and middle [if any])	Family Name or Surname	Residence (CITY AND EITHER STATE OR FOREIGN COUNTRY)
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☐ Additional inventors are being named on the ___ separately numbered sheets attached hereto.

TITLE OF THE INVENTION (280 characters max)

METHOD OF MAKING A FRANGIBLE NON-TOXIC PROJECTILE

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ENCLOSED APPLICATION PARTS (check all that apply)

☒ Specification *Number of Pages* [3]
☐ Drawing(s) *Number of Sheets* [ ]
☐ Application Data Sheet. See 37 CFR 1.76
☐ CD(s), Number ______
☐ Other *(specify)* ______

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

☐ Applicant claims small entity status. See 37 CFR 1.27
☒ A check or money order is enclosed to cover the filing fee
☐ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 02-2135
☐ Payment by credit card. Form PTO-2038 is attached.

Filing Fee Amount: $160.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.
☐ Yes, the name of the U.S. Government agency and the Government contract number are: ______

Respectfully submitted,

SIGNATURE George R. Repper (signature)　　Date 8-16-02

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REGISTRATION NO. 31,414
Docket Number: 1640-110

USE ONLY FOR FILING PROVISIONAL APPLICATION FOR PATENT

Method of Making a Frangible Non-Toxic Projectile

Field of the Invention

The present invention relates to the field of projectiles for firearms.

Description of the Background Art

Conventional firearm bullets often remain in one piece upon striking a hard surface. Although such bullets may deform, they can sometimes penetrate hard objects or ricochet upon striking a hard surface. Bullets that ricochet are undesirable for use by law enforcement officers, because of the increased risk that innocent by-standers might be injured or killed. Additionally, ricocheting bullets or bullets which penetrate hard objects are undesirable for use by security personnel at nuclear facilities, in airplanes, or other sensitive areas. It also is undesirable to utilize bullets formed of toxic materials.

There is a need in the art for non-ricocheting bullets and bullets which do not penetrate deeply into hard objects, made from non-toxic materials.

Description of the Invention

The present invention is directed to a method of making a projectile from non-toxic materials which is frangible (i.e., breaks up) on impact with a hard surface, thus reducing or eliminating ricocheting off the hard surface or deep penetration thereof.

The present invention involves forming a bullet core of substantially pure bismuth. In preferred embodiments, the substantially pure bismuth core contains no more than trace amounts of naturally-occurring elements, most preferably less than about 100 ppm of impurities. In particularly preferred embodiments, a bullet core manufactured in accordance with the present invention contains essentially no naturally-occurring trace elements.

The present invention may be utilized to form substantially lead-free projectiles, which preferably contain no more than trace amounts of lead, more preferably less than about 100 ppm of lead, and most preferably essentially no amount of lead.

The expression "non-toxic" as used herein with respect to bullets, bullet cores and projectiles, indicates that such contain no more than trace amounts of toxic elements, more

preferably less than about 100 ppm of toxic elements, and most preferably essentially no amounts of toxic elements.

A method of making a frangible, non-toxic projectile in accordance with the present invention utilizes a plurality of steps as outlined in the exemplary process set forth below. This exemplary process is for illustrative purposes only, and not intended to be limiting, since certain of the steps listed below may be left out or modified.

A quantity of substantially pure bismuth metal is heated to above its melting temperature (271.3° C, 520.33997° F) until it becomes a molten mass. Substantially pure molten bismuth is poured into a mold having a cavity shape which cools to form a bullet core of generally ogival shape.

A solidified, substantially pure bismuth core of generally ogival shape is inserted in a profile die having a desired bullet core profile and a small (0.020" to 0.038") bleed hole or holes in the side of said profile die. The solidified, substantially pure bismuth core of generally ogival shape is swaged in the profile die using sufficient pressure to create the final core shape and size, substantially eliminate any surface irregularities and, depending on caliber, bleed off between about three (3) and twelve (12) grains of bismuth metal.

A plurality of swaged, substantially pure bismuth cores of the desired shape and weight are cleaned in a detergent bath to remove contaminants and surface residue. Detergent residue from the swaged, substantially pure bismuth cores of the desired shape and weight is rinsed off.

The substantially pure bismuth cores of the desired shape and weight are placed in an acid activation tank, rinsed, and then immersed in a cyanide strike bath.

The essentially pure bismuth cores of the desired shape and weight then are further rinsed, and the cyanide-treated, essentially pure bismuth cores of the desired shape and weight are immersed in an electroplating barrel containing an acid-copper bath. Thereafter, voltage is

applied for a period of between seven (7) and fourteen (14) hours until plated bullets of near-final diameter are formed which are preferably completely covered with a coating of copper having a thickness between about 0.005" and about 0.008" per side. Tarnish inhibitor is applied to the plated bullets, and the plated bullets are dried.

The plated bullets are swaged in a profile die using sufficient pressure to attain the desired final shape and size. The plated bullets then are tumble-polished in a barrel containing polishing media, until the surfaces of the bullets attain a high luster. The plated bullets then are inspected and packaged.